



Northeast River Forecast Center (NERFC)

DOC-NOAA-NWS



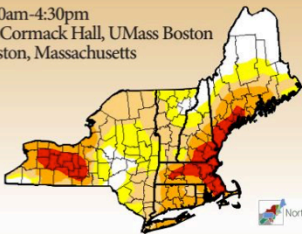
Save the date:

Tuesday, Oct. 11

Northeast Drought & Climate Outlook Forum

8:30am-4:30pm

McCormack Hall, UMass Boston
Boston, Massachusetts



- Detailed drought outlook for the rest of 2016
 - Drought impacts to date
 - Response and preparedness strategies
 - Resources for early warning of drought
 - Drought programs and assistance
 - Open discussion on drought-related information needs for critically affected sectors and communities
- Speakers include experts from the USDA (Northeast AgHub), NOAA's Northeast Regional Climate Center, the U.S. Geological Survey, the National Weather Service, state climatologists' offices, fisheries agencies, industry associations, and more.

For more information contact
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Ellen Mecray, ellen.lmecray@noaa.gov



Registration and agenda: <https://www.noaa.gov/sections/2016/northeast-drought-climate-outlook-forum>

Edward J Capone
Service Coordination Hydrologist
Edward.Capone@noaa.gov

Northeast River Forecast Center
weather.gov/nerfc



Building a Weather-Ready Nation

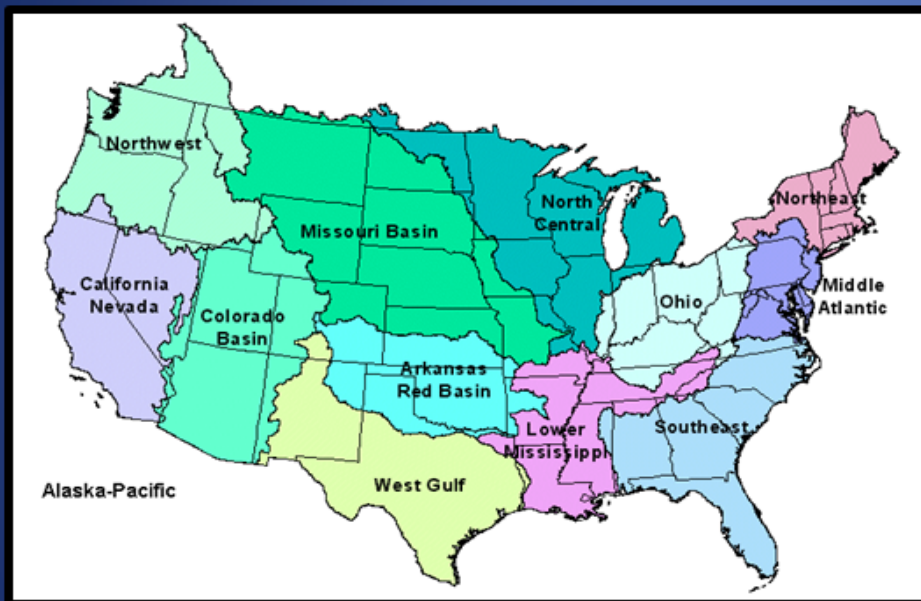


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NWS River Forecast Centers



- Mission: Protection of Life and Property
 - Flood Guidance
 - Water Supply
- 13 River Forecast Centers across USA
- 122 Weather Forecast Offices



Building a Weather-Ready Nation



NERFC Service Area

Includes Major Storm Tracks—Ocean and Orographic Influences



- **Major Watersheds**

- -Saint John
- -Penobscot
- -Androscoggin
- -Saco
- -Connecticut
- -Merrimack and Concord
- -Charles and Neponset
- -Blackstone
- -Taunton
- -Pawtuxet and Paucatuck
- -Hudson
- -Mohawk and Schoharie
- -Lake Champlain
- -Genesee
- -Buffalo Creeks



Building a Weather-Ready Nation



Monthly Water Resources Outlooks

Winter /Spring Bi-Monthly Briefings



NERFC Winter/Spring Briefings

➤ Next Briefing – 3/4/16

NERFC Winter/Spring Briefing
Fri, Feb 19, 2016 11:00 AM - 11:45 AM Eastern Standard Time

- Please join my meeting from your computer, tablet or smartphone.
<https://global.gotomeeting.com/join/369213021>
- You can also dial in using your phone.
United States **+1 (669) 224-3319**
Access Code: 369-213-021
More phone numbers
Canada (Long distance): **+1 (647) 497-9380**



➤ Brought to you by:

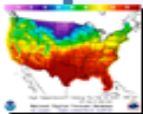
➤ **Edward Capone - Service Coordination Hydrologist**

➤ Overview to Include:

- • Potential flood outlook – convective/synoptic conditions
- • Stream flow-Groundwater-Soil moisture and Snow Water Equivalent conditions
- • Antecedent-Current-Future precipitation forecasts
- • Short and Medium Range Met Forecasts (especially potentially significant events)
- • Flood or Drought Outlook (Near term & Longer term)
- • [Snowpack/Ice Conditions](#)
- • [ENSO Conditions](#)
- • **Winter/Spring Briefings occur every 2 weeks into May**

National Weather Service

Protecting Lives and Property




Building a Weather-Ready Nation



What is a Drought

Many Ways to Define It!

- The World Meteorological Organization (WMO) defines different types of drought:
- 

WORLD
METEOROLOGICAL
ORGANIZATION

WEATHER CLIMATE WATER
- Meteorological
 - Climatological
 - Atmospheric
 - Agricultural
 - Hydrologic
 - Socioeconomic – i.e. Water supply and demand
- *“Drought is a normal, recurrent feature of climate, although it is erroneously considered as a rare and random event”*





Southern New England Droughts

Significant Drought Episodes since the early 1900s



- Most intense drought episodes included...

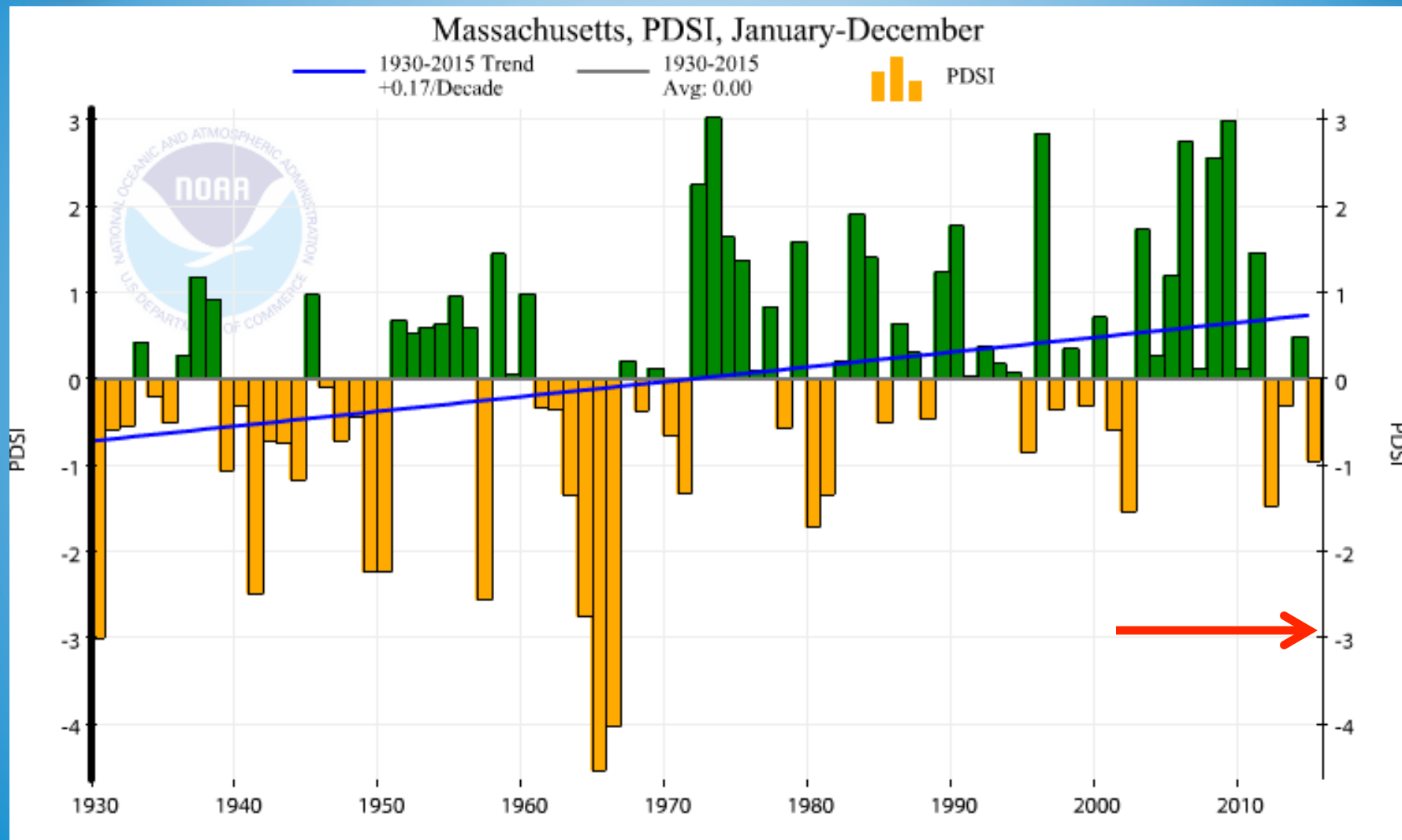
- 1922-1923
- 1924-1925
- 1929-1932
- 1939-1942
- 1956-1957
- 1961-1966...benchmark drought
- 1980-1981
- 1984-1985
- 1999
- 2001-2002
- 2015-2016





Palmer Drought Severity Index

Drought frequency has changed



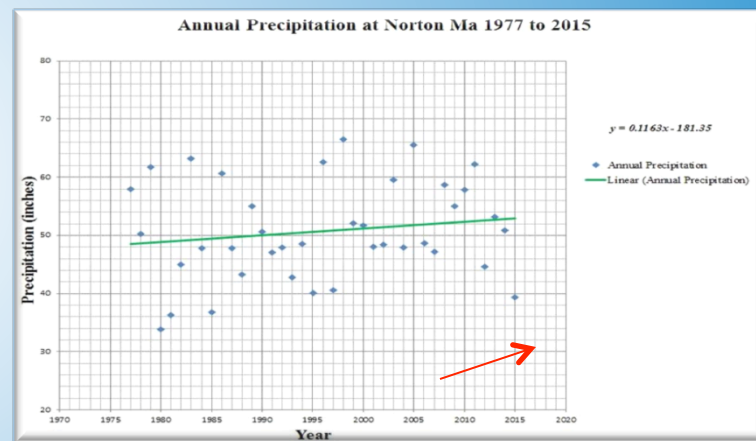


Droughts in Southern New England

Historical Perspective



- Drought Periods are not that rare -- nearly every 10 yrs
 - > Today's drought have a “flash” behavior/rapid onset
- 1960's drought the worst in the 20th Century (100yr/500yr)
- Normal Precipitation 47 to 52 inches
- Precipitation during droughts:
 - 70 to 80 percent of normal
 - Or 32 to 42 inches per year
- Temperatures above normal
- Most notable droughts in the past 50 years:
 - *Ended with normal fall and winter precipitation*
 - *Ended with multiple rain events or a tropical system*
 - *Some just end as inconspicuously as they began*





Drought

How did we get here?



- Record “Dry” Snow of 2015



- Record Cold 6 weeks 2015

NERFC Daily Briefing
Mar 10, 2015 - 11:32 am

*** SEA ICE ON THE MOVE ACROSS COASTAL SOUTHERN NEW ENGLAND ***

The warming weather has begun breaking up the abnormally thick sea ice that has formed in many harbors, bays and inlets across New England waters this winter. These pictures were taken on 9 March 2015 along the Cape Cod Canal in Bourne Massachusetts. The larger ice chunks were observed to be 8 to 12 inches thick. We expect this ice to continue to flow for the next week or two.

As of last week...the U.S. Army Corps of Engineers had restricted navigation of the Cape Cod Canal to steel hulled vessels greater than 60 feet only with no wooden or fiberglass hulled boats allowed.

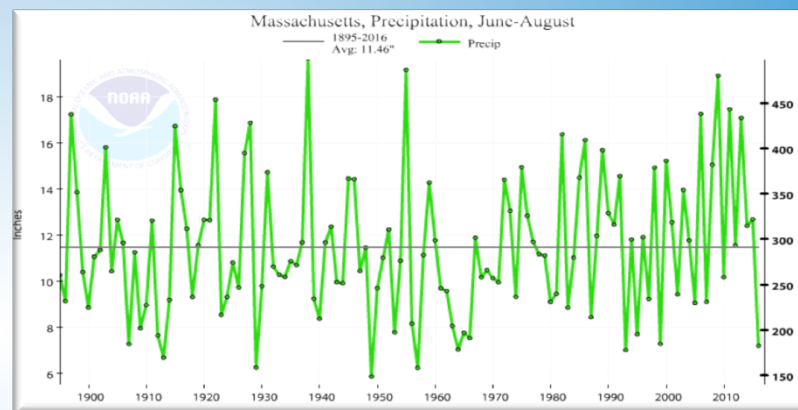
Horwood/NERFC

NOAA/National Weather Service
Northeast River Forecast Center

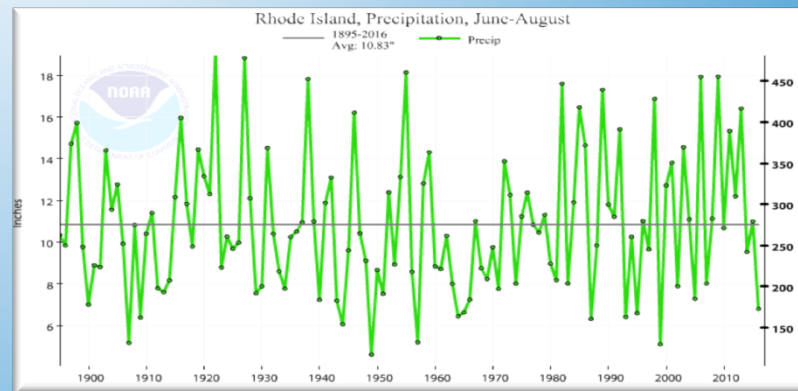
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<http://weather.gov/nerfc> Twitter @NWSNERFC

Summer 2016 Precip -- MA



Summer 2016 Precip -- RI

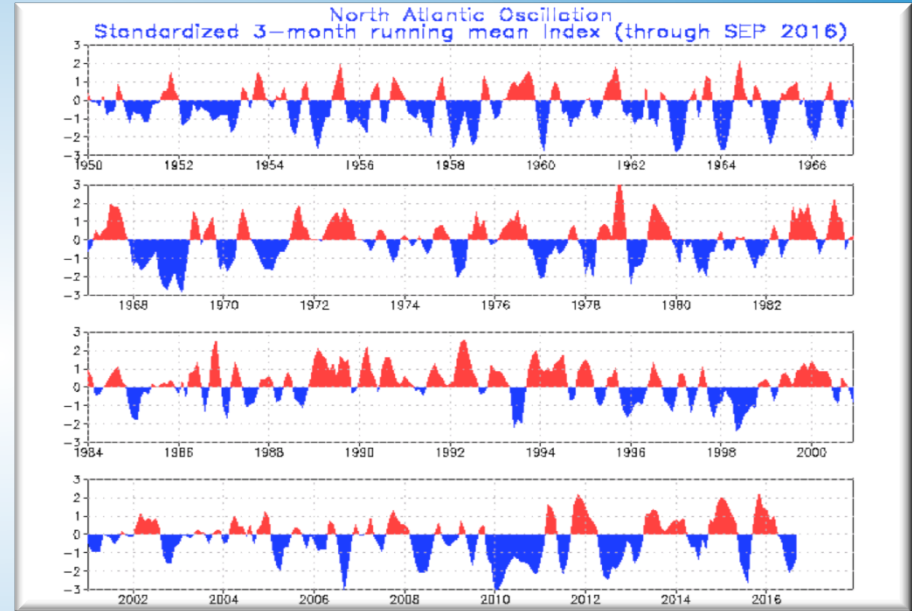
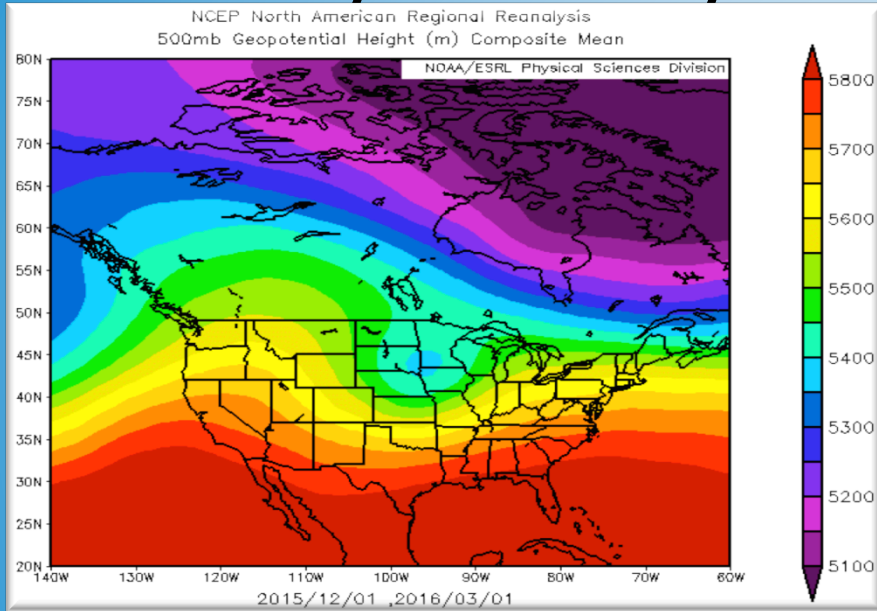


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Weather Pattern

Why Drier than Normal .. Multiple Years

- **Generally Governed by:**



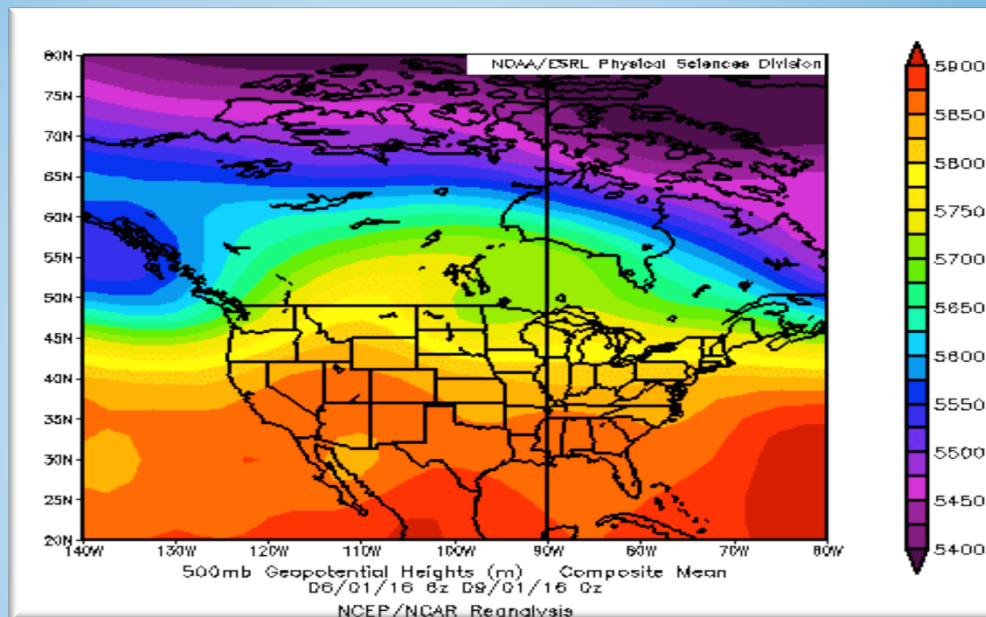
- **Cold Season**
- **Split flow ... lack of jet stream phasing near the East Coast**
- **Lack of blocking Positive NAO**
- **Deep Negative EPO drives Siberian Air into the NE for 2-3/2015**
- **Lack of deep moisture from Atmospheric Rivers (AR) ...Atlantic...Gulf...Caribbean...Pacific connections ... lack of multiple inch – 24hr precipitation events – orderly melt**
- **2015 Ocean temps limit coastal plain early convection...marine influence**



Weather Pattern

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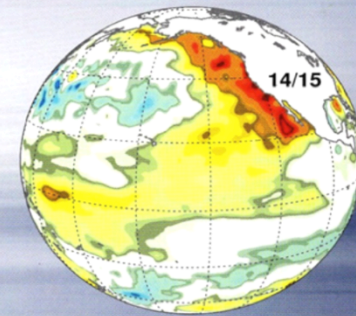
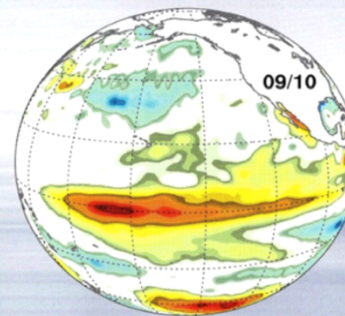
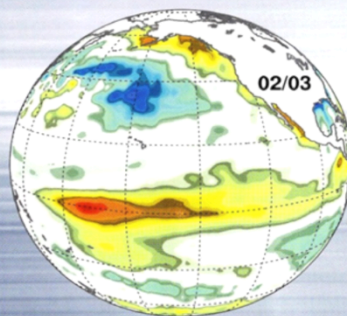
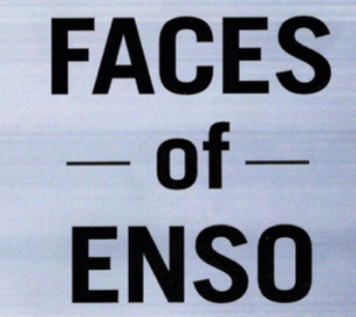
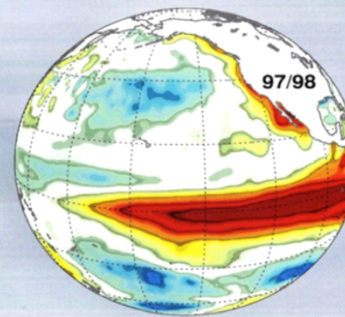
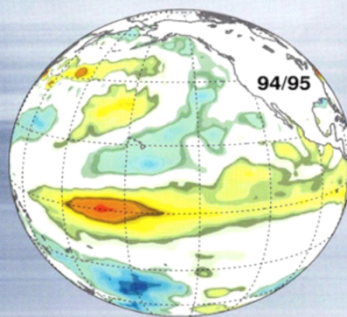
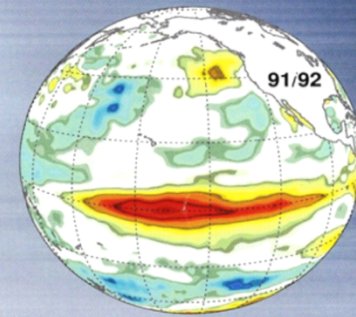
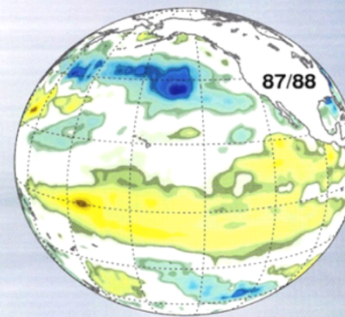
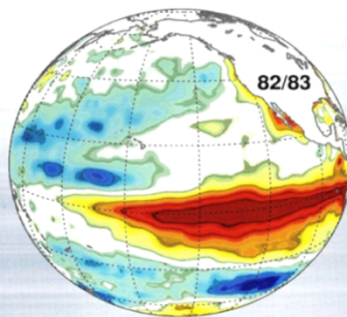
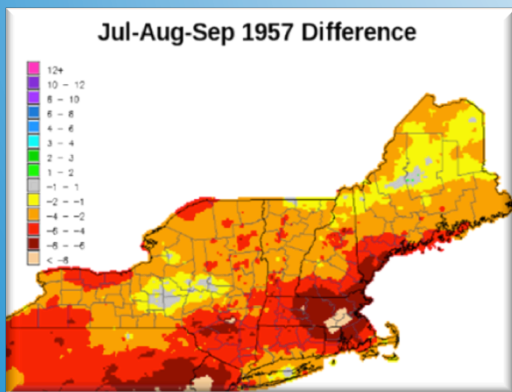
- Warm Season**
- Ridging Centered WestWNW flow over Northeast**
- Deep Atlantic/Gulf moisture not maximizing trajectory NE (cut-off)**
- Upper Level Confluent Flowyields precipitation suppression**
- Cold Atlantic Early in Season (2015) – strengthens Marine Layer -- convection less**
- Biggest Regional Convective outbreak occurs in February**
- El Nino 2015-2016**



The Many Faces of El Nino

Often starts out with a dry summer/fall

- Typically Dry Summer/
Dry Autumn Preceding
- Wet or Dry during
Transition phase to
Neutral/La Nina



FACES
— of —
ENSO

Bulletin of the AMS, vol 96, #6, June 2015

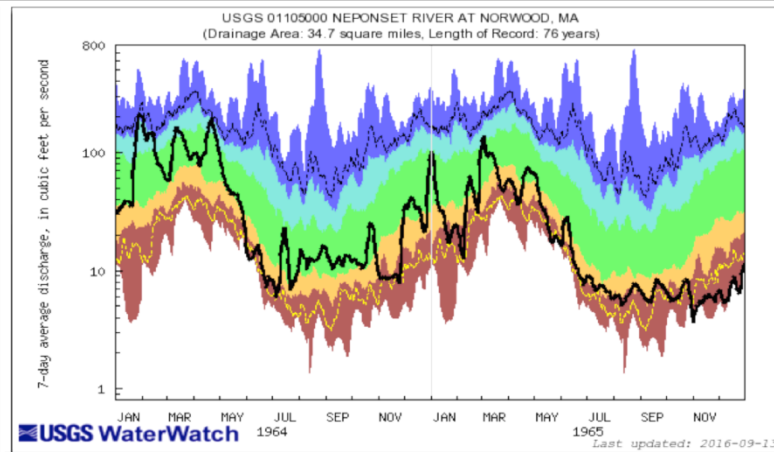
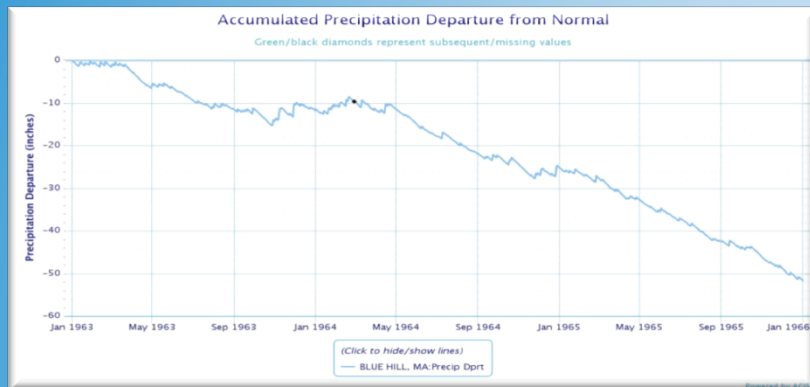


Are Flow Characteristics – Changing?

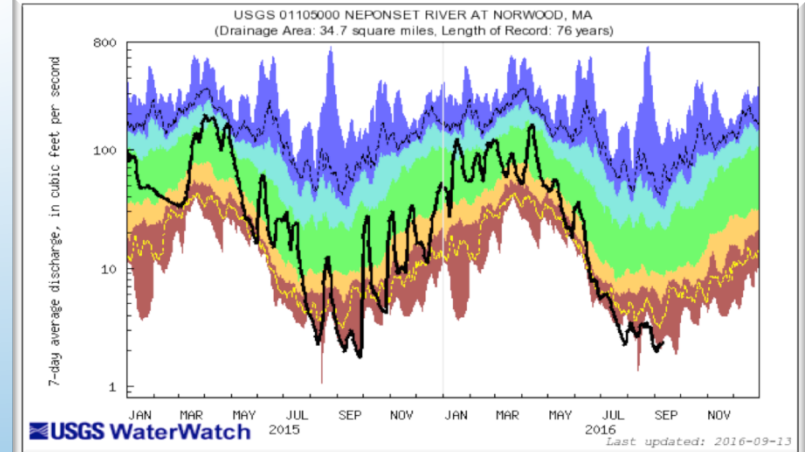
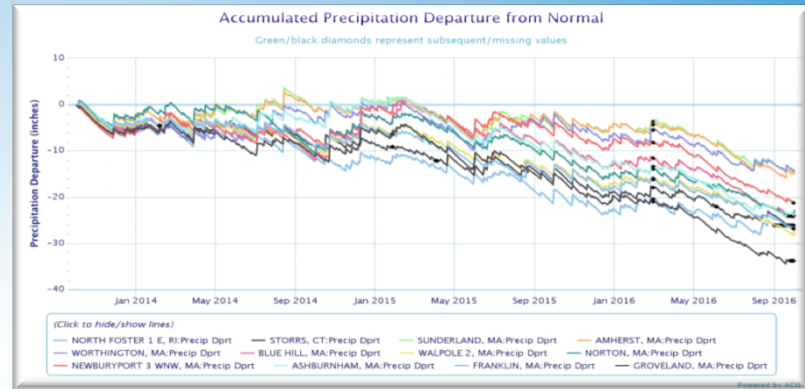
Yester-year rural-suburban to Today's Urban-Suburban



• 1960's Benchmark Drought



2016 Drought (2 yrs)



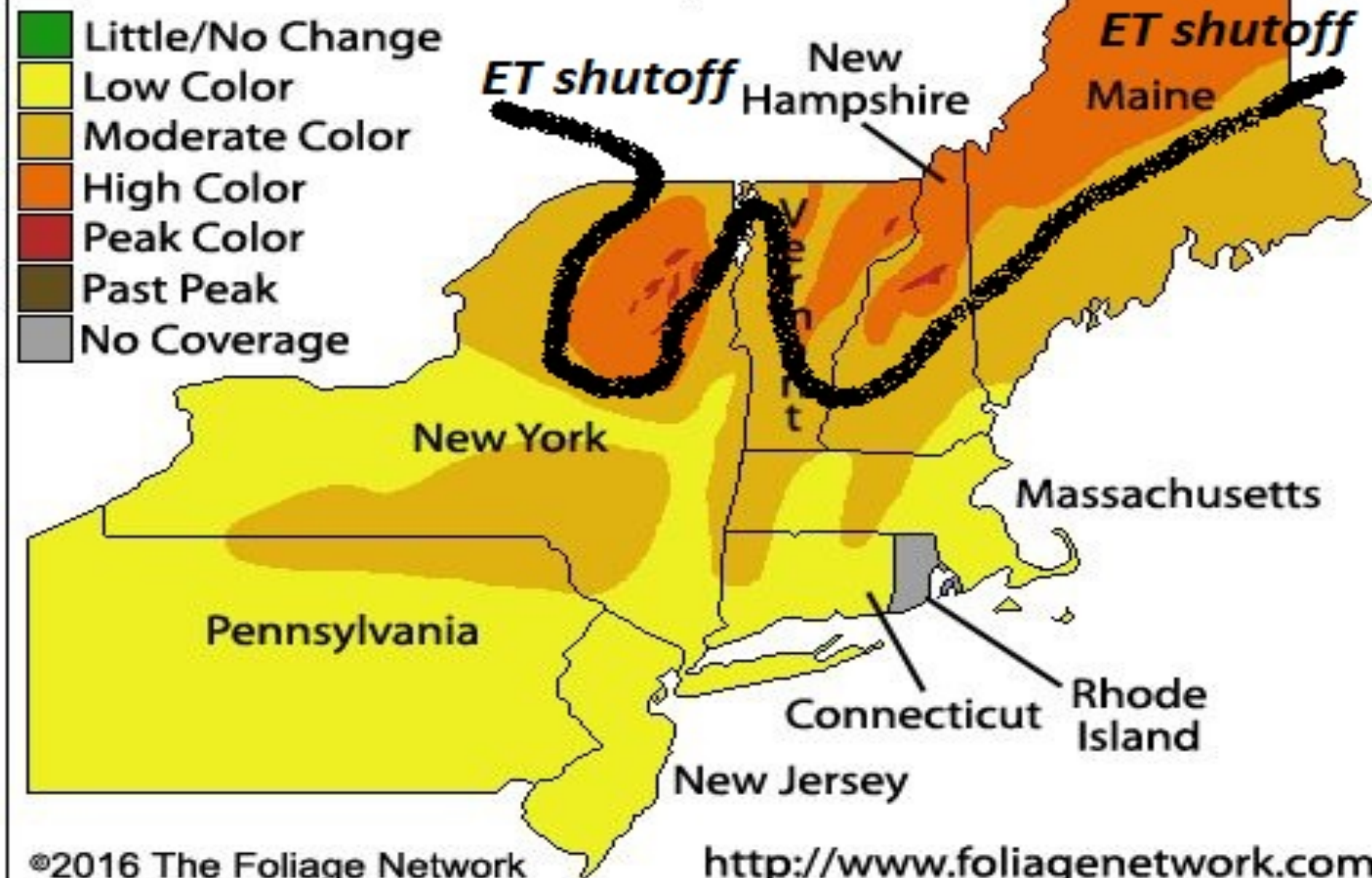
Explanation - Percentile classes					
lowest-10th percentile	5	10-24	25-75	76-90	95 90th percentile -highest
Much below Normal	Below normal	Normal	Above normal	Much above normal	Flow



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Foliage Color - Report #10

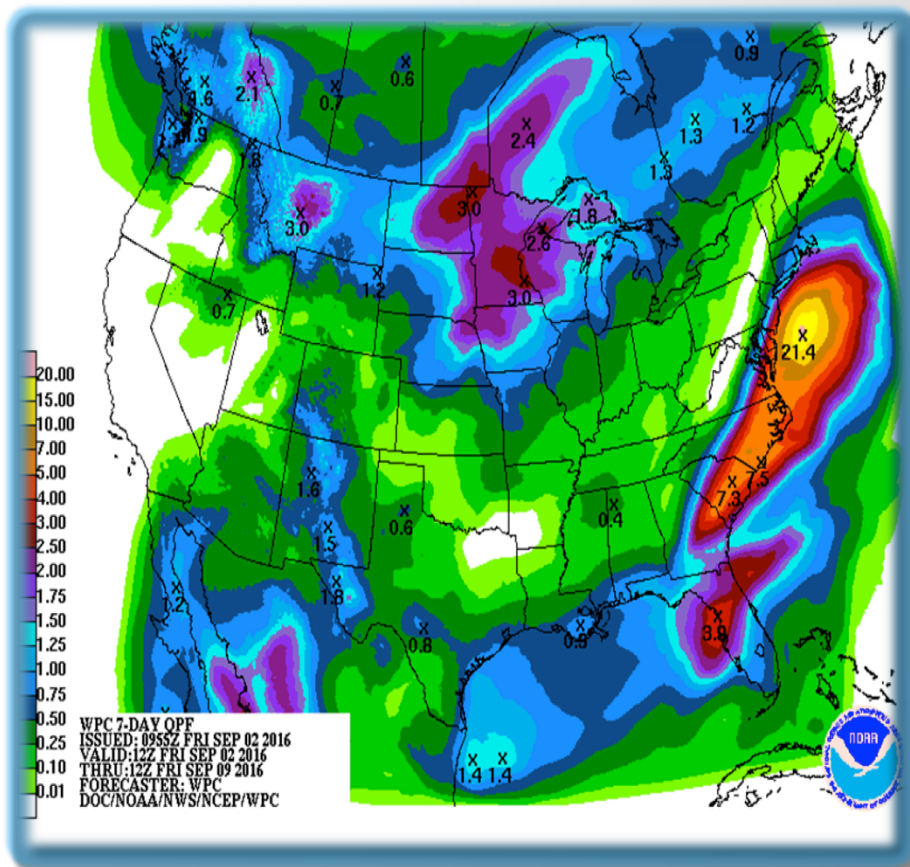
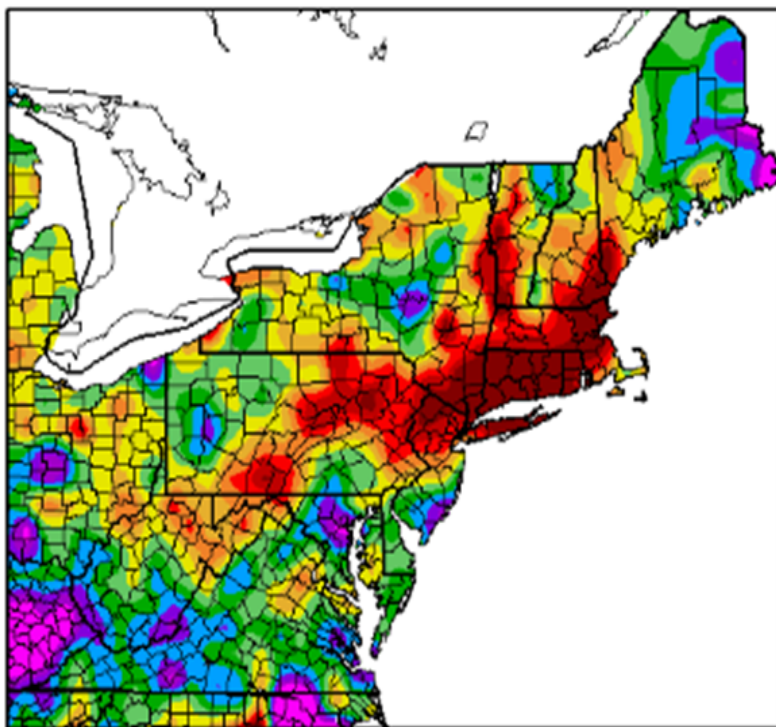
As of October 6, 2016



From Deficit to Deluge??

Do Droughts end with a Flood?

Departure from Normal Precipitation (in)
8/30/2013 – 8/29/2016



ted 8/30/2016 at HPRCC using provisional data.

Regional Climate Centers



“Do Droughts end with a Flood”

Real or Folklore?



- **Southern New England Drought Busters**
- 1961-1966 ...ends with normal precip Fall of '66...heavy snows in '67 ... major floods in '68
- 1980-1981 ...ends **with** normal Fall and Winter Precipitation during '81-'82
- 1984-1985 ...ends or nearly ends with rains late in Summer and Hurricane Gloria
- 1999 ...ends with Hurricane Floyd and earlier rains
- **2001-2002 ...bit longer of a struggle to get out of the drought**





“All Droughts end with a Flood”



THE TEXAS FLOODS ARE SO BIG THEY ENDED THE STATE'S DROUGHT

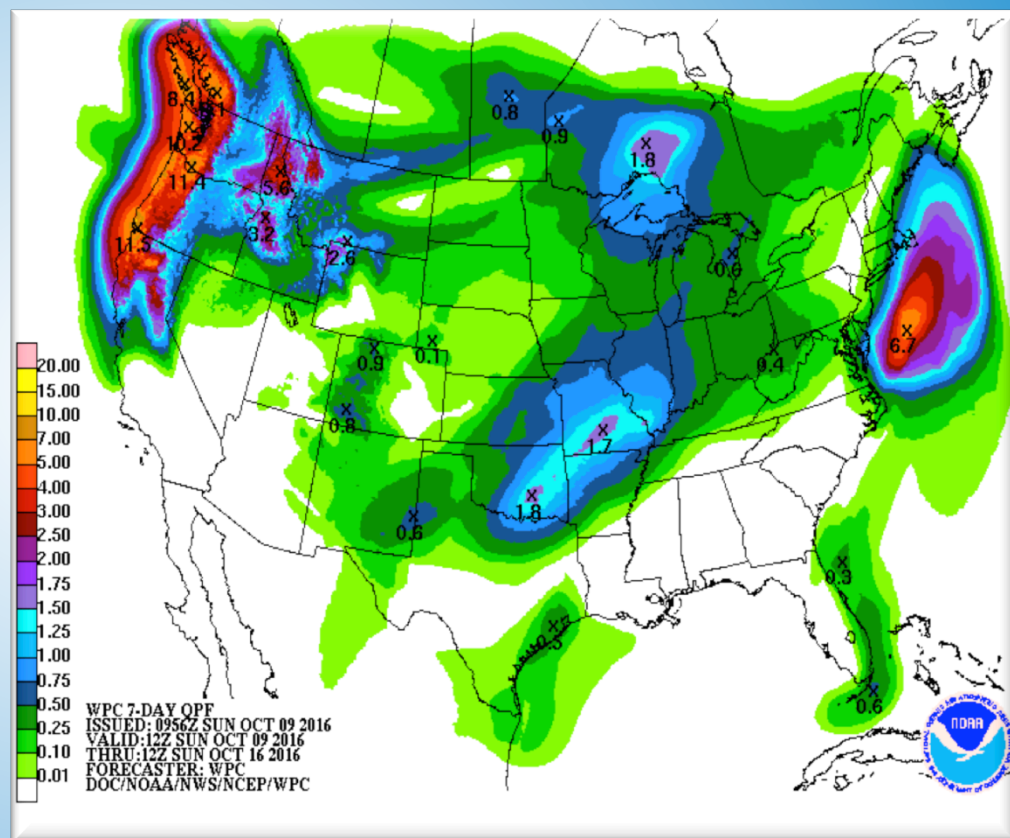
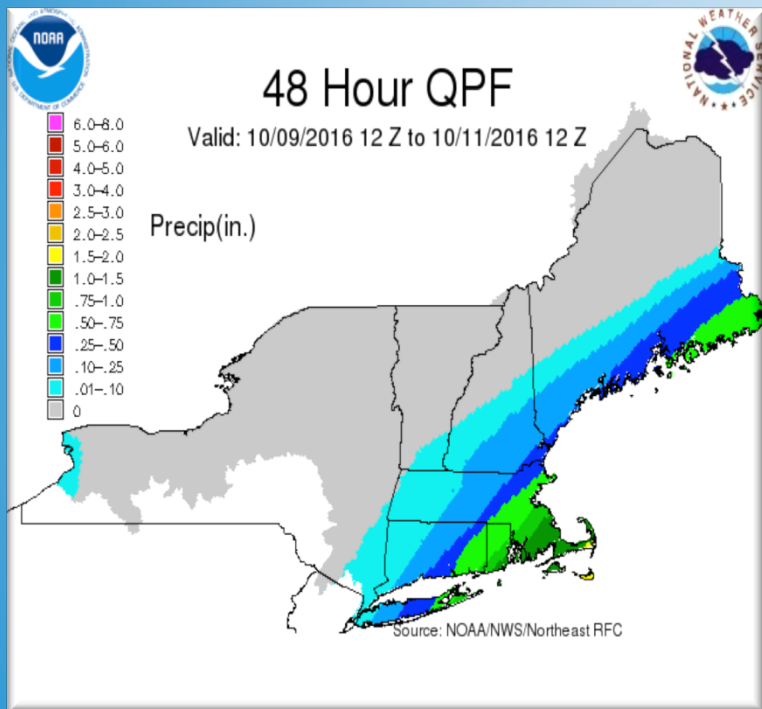


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Precipitation

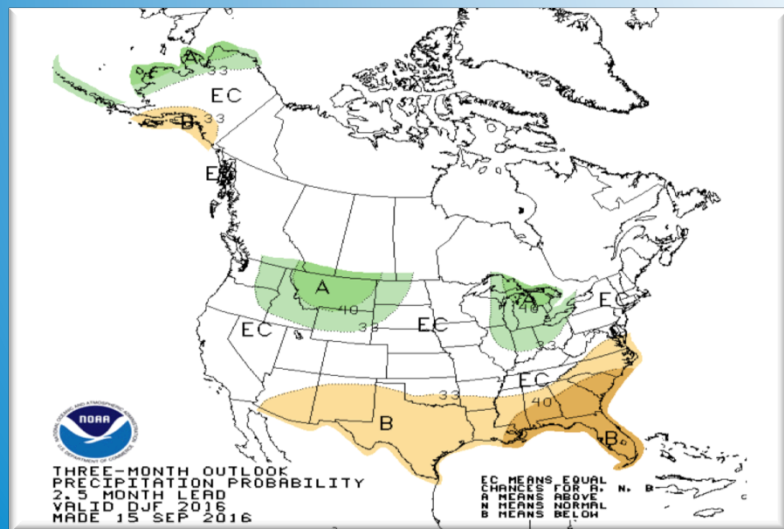
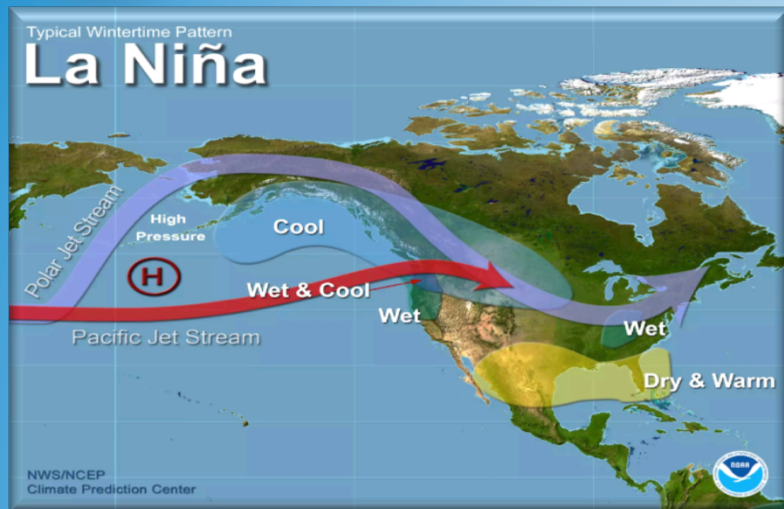
Quantitative Precipitation Forecast (QPF)





NOAA Winter Outlook

Neutral to borderline La Niña Conditions



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Visit Northeast River Forecast Center (NERFC)

445 Myles Standish Boulevard Taunton, MA.

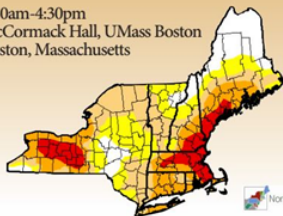


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Thank you!

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